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Claims 1-11 are pending. Claim 1 is amended by this preliminary amendment. Applicants request allowance of claims 1-11.

The Applicants received a final office action dated January 31, 2002. The Applicants responded under 37 CFR § 1.116, and the response included a Certificate of Mailing dated April 1, 2002. The two-month deadline on the January 31 office action was March 31, 2002. This year, March 31, 2002, fell on a Sunday, and the Applicants filed the response on the next business day, April 1, 2002. Thus, under 35 USC § 21, the response was timely filed within the two-month deadline for expedited procedure. The Applicants received an Advisory Action on June 4, 2002. The Examiner checked the box stating that the period for reply expires 3 months from the mailing of the final office action. This is incorrect because the Applicants timely filed the response on April 1, 2002. Thus, under MPEP 706.07(f), the period for reply should expire on the mailing date of the Advisory Action. The Applicants assume that the Examiner inadvertently checked the wrong box, and will assume that period for reply expired on the mailing date of the Advisory Action, June 4, 2002. Thus, fees for a one-month extension are included with this preliminary amendment.

The Applicants submit that amended claim 1 is novel and non-obvious over any reference previously cited by the Examiner, and over any art known to the Applicants. Two of the references previously cited by the Examiner in rejecting claim 1 are U.S. patent 5,394,758 (Wenger) and U.S. patent 5,663,509 (Lew). Wenger teaches a flow meter (1) comprised of flanges (19, 20), flow tubes (11, 12), brace bars (32, 33), a driver (16), and pickoffs (17, 18) (FIGS. 1-2; column 3, line 58 thru column 5, line 17). The flow tubes are loops that have straight portions (111, 112) and a curved portion (FIGS. 1-2; column 3, line 66 thru column 4, line 12). On the other hand, amended claim 1 of the pending application describes a first flow tube forming substantially a semicircle between an inlet end and an outlet end. Amended claim 1 also describes a second flow tube forming substantially a semicircle between an inlet end and an outlet end. A flow tube with a straight portion, such as in Wenger, cannot form a semicircle between an inlet end and an outlet end as described in amended claim 1. The semicircle shape formed by the flow tubes reduces the dimensions of the flow meter, which could be an advantage over Wenger. Thus, claim 1 is novel and non-obvious over Wenger.

Lew teaches flow meters of various shapes. None of the flow meters teaches a flow tube forming a semicircle as described in amended claim 1. For example, FIG. 5 in Lew shows a flow meter with two flow tubes (44, 45). The shape of the flow tubes are a straight portion at one end, three curved portions that form a U-shape, and a straight portion at the other end. The three portions are contiguous to form a horse-shoe shape. Because the flow tubes in Lew have straight portions and multiple curved portions, Lew cannot teach a first flow tube forming substantially a semicircle between an inlet end and an outlet end, or a second flow tube forming substantially a semicircle between an inlet end and an outlet end. Thus, claim 1 is novel and non-obvious over Lew.

For the above reasons, amended claim 1 is novel and non-obvious over Wenger, Lew, or any other references previously cited by the Examiner or known to the Applicants. Claims 2-11 are allowable as being dependent on claim 1. The Applicants submit that there may be additional reasons in support of patentability, but that such reasons are moot in light of the above remarks and are omitted in the interests of brevity. The Applicants respectfully request allowance of claims 1-11.

Any fees in addition to the fees submitted may be charged to deposit account 03-1725.

Respectfully submitted,

Date: 7-3-02

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Version with Markings to Show Changes Mad

In th Specification

The following represent marked-up versions of the amendments made to the specification.

The paragraph on page 3, beginning on line 27:

The flag dimension of the flow tube is reduced by forming the flow tubes in a [substantially semicircular arc] semicircle between inlet ends and outlet ends of the flow tubes. The [semicircular arc] semicircle shape of the flow tubes reduces the rise of flow tube to reduce the flag height. In order to increase the accuracy of the flowmeter, the entire length of the [semicircular arc] semicircle must vibrate.

The paragraph on page 3, beginning on line 32:

A driver is affixed to the flow tubes at a position along [the semicircular arc of] each flow tube that is substantially perpendicular to a plane containing the inlet end and the outlet end of the flow tube. The driver is positioned at this point to minimize the amount of energy applied to the flow tubes by the driver to cause the flow tubes to oscillate. Drive signals are applied to the driver to cause the driver to oscillate the flow tubes at a low amplitude to reduce the stress applied to brace bars affixed to the flow tubes. The driver must also drive the flow tubes to vibrate at a frequency that is higher than conventional flow tubes.

The paragraph on page 7, beginning on line 6:

In order to have reduced flag dimension, flow tubes 103A-103B [have a substantially semicircular arc] each form a semicircle 150-150' between an inlet end 151-151' and an outlet end 152-152'. The semicircle shape of flow tubes 103A-103B [Substantially semicircular arc 150-150'] reduces the flag dimension by creating a continuous curve in flow tubes 103A-103B. The semicircle shape allows [Substantially semicircular arc 150-150' must be used in order to allow] flow tubes 103A-103B to be of a sufficient diameter to facilitate large flow rates of material flowing through Coriolis flowmeter 5. In order to connect flow tubes 103A-103B serially into a pipeline, inlet manifold 102 and outlet manifold 102' may have a substantially 90 degree bend in a flow path to direct flow from the pipeline into

[substantially semicircular arc 150-150'] flow tubes 103A-103B.

The paragraph on page 7, beginning on line 15:

To achieve zero stability and to separate vibrational modes of the flow tubes 103A-103B, a first brace bar 120 and a second brace bar 121 are affixed to flow tubes 103A and 103B. First brace bar 120 is affixed to flow tubes 103A-103B proximate inlet end 151 to connect flow tubes 103A and 103B to control oscillations of flow tubes 103A-103B. Second brace bar 121 is affixed to flow tubes 103A-103B proximate outlet end 152 to connect flow tubes 103A and 103B to control oscillations of flow tubes 103A-103B. In a preferred exemplary embodiment, first brace bar 120 and second brace bar 121 are affixed to flow tubes 103A-103B substantially 180 degrees apart from each other [on substantially semicircular arc 150-150'].

The paragraph on page 7, beginning on line 24:

Driver 104 is affixed to flow [tube] tubes 103A and 103B at a position [on semicircular arc 150-150'] that is substantially at a midpoint between inlet 151-151' and outlet 152-152' of flow tubes 103A-103B. This position allows driver 104 to apply the greatest amount of force to flow tubes 103A-103B using the least amount of power. Driver 104 receives signals from meter electronics 20 via path 110 that cause driver 104 to oscillate at a desired amplitude and frequency. In a preferred exemplary embodiment, the frequency of a vibration is substantially equal to a first out of phase bending mode of flow tubes 103A-103B which is a higher frequency than conventional Coriolis flowmeters. In order to reduce stress from the higher frequency, it is desired to maintain a low amplitude of vibration in the preferred exemplary embodiment.

The paragraph on page 8, beginning on line 2:

In order to vibrate flow tubes 103A-103B at a high frequency and low amplitude, pick-offs 105-105' [must be] are affixed to flow tubes 103A-103B at position where the greatest amount of vibration may be sensed in flow tubes 103A-103B. This allows pick-offs 105-105' to detect the greatest amount of effect of Coriolis forces caused by the flowing material. In a preferred embodiment, the pick-offs 105-105' are positioned at a position that is substantially 30 degrees from

axises w-w'. However, the pick-offs 105-105' may be placed at a position anywhere between 25 and 50 degrees from the w-w' axises when conventional electronics are used to drive the flowmeter.

The paragraph on page 8, beginning on line 12:

FIG. 2 illustrates a spacer 200 affixed to flowmeter sensor 10. Spacer 200 maintains a constant distance between inlet manifold 102 and outlet manifold 102'. Unlike conventional spacers in Coriolis flowmeters, spacer 200 is made of minimal material. Spacer 200 has square ends 190-191 on opposing sides. In a preferred exemplary embodiment, the square ends 190-191 are cast as square plates in manifolds 102-102'. Four walls represented by walls 201-204 connect each edge of square bases 190-191 to form an enclosure. Openings 210 allow [substantially semicircular arcs 150-150' of] flow [tube] <u>tubes</u> 103A-103B to protrude from spacer 200.

The paragraph on page 8, beginning on line 21:

FIG. 3 illustrates a casing 300 for enclosing flow tubes 103A-103B (Shown In FIG. 1). Casing 300 is a structure having a hollow inside that fits over flow tubes 103A-103B and is affixed to spacer 200 in some manner such as a weld, or nuts and bolts. Casing 300 prevents atmosphere from entering the enclosure.

<u>In the ABSTRACT</u>

A Coriolis flowmeter sensor capable of handling large mass flow rates and having a reduced flag dimension. In order to have a reduced flag dimension, <u>each of</u> the flow tubes [are formed to have a substantially semicircular arc] <u>forms a semicircle</u> between an inlet and an outlet. Brace bars, connected to the flow [tube] <u>tubes</u> proximate the inlet and outlet, separate the frequencies of vibration in the flow tubes. Pick-offs are positioned [upon the substantially semicircular arc of] <u>on</u> the flow [tube] <u>tubes</u> at a position that [allow] <u>allows</u> the pickoffs to maximize detection of low amplitude, high frequency vibrations of the flow tubes required to have a reduced flag dimension.

In the Claims

The following represent marked-up versions of the amendments made to the claims. All of the claims are presented, amended or not, in order to avoid confusion in the event of future prosecution.

1. (Twice Amended) A Coriolis flowmeter having a reduced flag dimension comprising:

a first flow tube having an inlet end and an outlet end, said first flow tube forming [a substantially semicircular arc] <u>substantially a semicircle</u> between said inlet end of said first flow tube and said outlet end of said first flow tube;

a second flow tube having an inlet end and an outlet end, said second flow tube forming [a substantially semicircular arc] <u>substantially a semicircle</u> between said inlet end of said second flow tube and said outlet end of said second flow tube;

a driver affixed to said first flow tube at a point on [said semicircular arc of] said first flow tube that is substantially perpendicular to a bending axis of said first flow tube, said driver also affixed to said second flow tube at a point on [said semicircular arc of] said second flow tube that is substantially perpendicular to a bending axis of said second flow tube, wherein said driver oscillates said first flow tube and said second flow tube in opposition to each other;

a first brace bar affixed to said first flow tube proximate said inlet end of said first flow tube and affixed to said second flow tube proximate said inlet end of said second flow tube;

a second brace bar affixed to said first flow tube proximate said outlet end of said first flow tube and affixed to said second flow tube proximate said outlet end of said second flow tube; and

pick-offs affixed to said first flow tube [on said substantially semicircular arc of said first flow tube] and said second flow tube [on said substantially semicircular arc of said second flow tube] in a position that allows said pick-offs to detect [the greatest] <u>a desired</u> amount of Coriolis force at a low amplitude vibration.

2. (Amended) The Coriolis flowmeter of claim 1 further comprising:

an inlet manifold affixed to said inlet end of said first flow tube and said inlet end of said second flow tube to affix said first flow tube and said second flow tube

to a pipeline.

3. (Unchanged) The Coriolis flowmeter of claim 2 further comprising:
a substantially 90 degree bend in a flow path through said inlet manifold.

4. (Amended) The Coriolis flowmeter of claim 1 further comprising:
an outlet manifold affixed to said outlet end of said first flow tube and said outlet end of said second flow tube to connect said first flow tube and said second flow tube to a pipeline.

5. (Unchanged) The Coriolis flowmeter of claim 4 further comprising:
a substantially 90 degree bend in a flow path though said outlet manifold.

6. (Amended) The Coriolis flowmeter of claim 1 further comprising:
an inlet manifold affixed to said inlet end of said first flow tube and said inlet end of said second flow tube to affix said first flow tube and said second flow tube to a pipeline;
an outlet manifold affixed to said outlet end of said first flow tube and said outlet end of said second flow tube to connect said first flow tube and said second flow tube to said pipeline; and
a spacer affixed to said inlet manifold and said outlet manifold to maintain a fixed distance between said inlet manifold and said outlet manifold.

7. (Amended) The Coriolis flowmeter of claim 6 wherein said spacer comprises:
an inlet end affixed to said inlet manifold;
an outlet end affixed to said outlet manifold;
a top side, a bottom side, a front side, and a back side each extending between said inlet end of said spacer and said outlet end of said spacer to form a rectangular body; and
openings through said top side of said spacer through which said first flow tube and said second flow tube are affixed to said inlet manifold and said outlet manifold.

8. (Unchanged) The Coriolis flowmeter of claim 7 further comprising:

a casing that encloses said first flow tube and said second flow tube affixed to said top side of said spacer.

9. (Amended) The Coriolis flowmeter of claim 8 wherein said casing comprises:

a front side wall;

a back side wall; and

a mass affixed to said front side wall and said back side wall to change vibrational modes of said casing.

10. (Amended) The Coriolis flowmeter of claim 1 wherein said position of said pick-offs is substantially 25-50 degrees from said bending axis of said first flow tube and said bending axis of said second flow tube.

11. (Amended) The Coriolis flowmeter of claim 10 wherein said position of said pick-offs is 30 degrees from said bending axis of said first flow tube and said bending axis of said second flow tube.